01-D-101, Distributed Information Systems Laboratory (DISL)
Sandia National Laboratories, Livermore, California

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 2001 Budget Request *(Preliminary Estimate)*	2Q 2001	2Q 2002	3Q 2002	1Q 2004	35,500	38,100

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
2001	2,300	2,300	1,600
2002	15,400	15,400	6,350
2003	17,800	17,800	18,000
2004	0	0	9,550

3. Project Description, Justification and Scope

The Distributed Information Systems Laboratory (DISL) is a proposed new research facility at Sandia National Laboratories to develop and implement distributed information systems for Defense Programs (DP). It consolidates at one accessible location all activities focused on incorporating those systems to support DP's Stockpile Stewardship Program (SSP). Research at DISL will concentrate on secure networking, high performance distributed and distance computing, and visualization and collaboration technologies that do not exist today, yet need development to help create design and manufacturing productivity environments for the future Nuclear Weapons Complex (NWC). The major objective of DISL is to bring together these technologies to develop a distributed information systems architecture that will link the NWC of the future.

Description:

The proposed facility requires approximately 70,400 gross square feet (gsf) of space to house 130 people needed to perform the necessary research and associated functions. Space will be provided for laboratories, research and development offices, collaborative and meeting areas, management and administrative areas, and public and support areas. Laboratory space will include a central distributed computing and networking laboratory, an advanced visualization laboratory complex, and smaller ancillary laboratories. The laboratories and adjacent demonstration areas will be on raised access flooring, and will have accessible interstitial space above the ceiling, to facilitate changes and modifications to mechanical and electrical systems. The research and development offices will house Sandia technical staff and visiting researchers, and will accommodate multiple computer workstations with monitors and peripherals.

Collaborative and meeting areas will include demonstration and conference rooms to facilitate work with industry and academia. The laboratories, collaborative areas, and office areas will be constructed as secure vault-type rooms to provide the capability to allow classified or unclassified work to be performed simultaneously in adjacent areas should the facility not be upgraded to TSRD level. If the facility is upgraded to TSRD, these areas will support individual programs with common need-to-know information. These areas will be interconnected with a large amount of fiber-optics communications to accommodate the work there. A lobby, reception area, and typical building support space, such as storage and break/vending areas, will also be included in the facility.

DISL will be situated in the central part of Sandia's California (SNL/CA) site, near existing development, parking, and utilities, and easily accessible to visiting working partners. Improvements to land include site work such as new curbs and gutters at existing streets, walkways, planters, minor paving, and landscaping and irrigation surrounding the facility. Utilities work includes extensions of existing nearby water, storm and sanitary sewer, and electrical power and communications systems to the building. The planned location for the facility is currently occupied by Sandia's Building 913, which is in the process of being decontaminated and demolished using operations and maintenance funding. If demolition is not completed in time to allow DISL construction at the preferred location, DISL will be constructed at a nearby alternative location within the central SNL/CA site. The project scope is the same for either location.

Standard equipment will include new and relocated furniture, and multimedia and video conferencing equipment to facilitate collaborations with others offsite. Research and development equipment (Major Computer Items) will include high-performance design, analysis, and graphics workstations ($1,635,000), a high-performance storage system ($470,000), multi-processor and multimedia servers ($1,681,000), advanced visualization systems, including a video wall ($1,572,000), communications plant system ($1,532,000), communications switches, routers, and encrypters ($1,206,000), an immersive collaborative engineering system ($897,000), and equipment cabinets and ancillary networking equipment ($538,000).

Justification:

DP is responsible for the management of the NWC. Changes in the military-political landscape, including the cessation of underground testing and a significantly smaller nuclear weapons manufacturing complex, require DP to find new ways of ensuring a safe, reliable, and secure nuclear weapon stockpile while meeting unchanged certification requirements. How DP will meet these challenges, the “must, should, and could” stockpile refurbishment decisions and schedule, are defined by the Stockpile Life Extension Program (SLEP). To meet DP mission goals and SLEP requirements, DP has developed a Stockpile Stewardship Program that plans to use technology to monitor, remanufacture, and test, through simulation, weapons in the current and future stockpiles. The NWC of the future will be linked by a distributed information architecture which will be developed, in large part, at DISL.

Examples of DP efforts that support the Stockpile Stewardship Program include:

- The Accelerated Strategic Computing Initiative (ASCI), which will create the leading-edge computational modeling and simulation capabilities to help weapons designers shift from test-based methods to computation-based methods for stockpile certification.
- The Distance Computing and Distributed Computing ($DisCom^2$) Program, which will accelerate the ability of DP labs and plants to apply vital high-end and distributed resources (from desktops

to TeraOps [1 TeraOp = 10^{12} floating-point operations per second]) across thousands of miles to meet the urgent and expansive design, analysis, and engineering needs of stockpile stewardship.

- The Advanced Design and Production Technologies (ADAPT) Initiative's Enterprise Integration (EI) strategy, which will:
  - Create seamless, secure, and connected communications.
  - Create products and process information systems that allow rapid access to weapons information.
  - Encourage streamlined business and engineering practices that are more responsive and productive.

With these and other Programs, DP envisions a highly distributed, but totally integrated, system of facility nodes that support information networking and provide cost-effective information integration, access, and preservation.

To realize the mission objectives outlined above, DP must have the ability to access information from across the NWC, fully integrate the design and re-manufacture of nuclear weapons (and components) so as to reduce the redesign time for nuclear weapons by half, and have a means to incorporate emerging information systems technology from the private sector and academia as rapidly as possible. The proposed DISL at SNL will provide the means to accomplish these goals.

The DISL will provide technologies that will allow seamless, secure, reliable access to scientific and engineering and business information by the many geographically dispersed elements of the NWC, including laboratories, production facilities, and DOE offices. DISL will serve as a connectivity node, connecting people to people, people to machines, and machines to machines, allowing access, integration, and preservation of information across the entire NWC.

The DISL will focus on research and development that will greatly enhance the integration of design and manufacturing tasks and thus reduce the time required to redesign nuclear weapons in the enduring stockpile. DISL will house weapon systems engineers together with computer scientists to foster the interchange necessary to ensure that the right technologies for the weapons program are developed when and as they are needed. Specifically, the long-term objective of DISL is to bring together prototype technologies to develop a distributed information systems infrastructure that will be incorporated into DP's virtual enterprise for SSP.

The DISL will serve as a technology deployment center/user facility to accelerate the introduction of advanced information systems technology into the NWC. DP laboratories can neither create a virtual enterprise nor sustain a vibrant high-performance computing market on their own, and so must work closely with industry and academia to develop critical new information technology. Extensive collaboration with industry and academia is a major strategy of ADAPT, ASCI, and DisCom^2, and, therefore, is a cornerstone of the DISL. In addition, the existence of DISL will create opportunities for the DP laboratories to influence the course of technology development in the private sector and maximize benefits to their related core programs.

Existing facilities within the NWC cannot satisfy the need for the development of integrated information systems required to support SSP and its programs. While many of the elements needed to support DP's distributed information systems requirements exist at SNL/CA, the necessary facilities are absent—either

they do not have laboratory areas with appropriate infrastructure (computer raised floor; heating, ventilating and air conditioning (HVAC); communications) and size to support required technologies, or they must remain completely classified (these buildings are identified in the SNL/CA Secured Area Master Plan). DISL must have space for classified activities, but must also facilitate unclassified exchanges. Thus DP proposes to create DISL as a single facility—one that consolidates activities and equipment; is sized appropriately; provides space for visiting personnel from the private sector, academia, and other laboratories; and possesses a suitable technological infrastructure, to ensure that DP can meet its critical mission responsibilities related to SSP.

The President has mandated that the nuclear weapons stockpile be safe, secure, and reliable. All U.S. weapons require periodic refurbishment and remanufacture, because they contain components that have limited lifetimes. DP's SLEP lays out the schedule of weapon system alterations, modifications, and improvements to be completed in the coming decades. A major step in the refurbishment and remanufacture of a weapon is Full-Scale Engineering Development (FSED), the step during which weapon designers and systems engineers develop engineering designs, and test and implement them in the production plants. After a weapon has been redesigned through FSED, it goes into production in the weapon plants. A key milestone is the date when the first production unit (FPU) is assembled. SLEP calls for refurbishment in the near-term on the W80 (FPU in FY 2005), in the mid-term on the B83 and W78 (FPU in FY 2007), and in the longer-term on the W76 (FPU in the FY 2007—2011 time frame).

To meet the SLEP schedule, significant reductions in FSED time for weapon systems will be required within a decade. For example, FSED of weapon arming, fuzing, and firing subsystems need to be reduced to 3 years from the 6 required in the past. With present technology, this cannot be done. DISL, planned to be operational in FY 2004, will provide by FY 2006 the technology to enable this reduction in schedule, and is therefore an essential part of DP's plan to meet the SLEP goals. In the specific case of the W76, DISL-provided technology will enable the FSED to be completed in the 2006—2008 time frame, thus enabling FPU to occur on schedule.

There is no facility available that is adequate in its current state to support the distributed information systems research and development activities required to meet DP programmatic goals.

Project Milestones:

FY 2001: Start Design 2Q

4. Details of Cost Estimate

(dollars in thousands)

	Current Estimate	Previous Estimate
Design Phase		
Preliminary and Final Design costs (Design Drawings and Specifications - $1,136)	1,620	NA
Design Management Costs (1.3% of TEC)	467	NA
Project Management Costs (0.6% of TEC)	199	NA
Total Design Costs (6.4% of TEC)	2,286	NA
Construction Phase		
Improvements to Land	269	NA
Buildings	14,996	NA
Utilities	303	NA
Standard Equipment	1,530	NA
Major Computer Items	9,531	NA
Inspection, Design and Project Liaison, Testing, Checkout and Acceptance	619	NA
Construction Management (2.6% of TEC)	934	NA
Project Management (1.2% of TEC)	423	NA
Total Construction Costs (80.6% of TEC)	28,605	NA
Contingencies		
Design Phase (0.9% of TEC)	325	NA
Construction Phase (12.1% of TEC)	4,284	NA
Total Contingencies (13.0% of TEC)	4,609	NA
Total Line Item Costs (TEC)	35,500	NA

This estimate was prepared by GEZ Architects-Engineers and Sandia on the basis of the DISL conceptual design report dated March 1998. Escalation is based on the January 1999 Update of the Departmental Price Change Index for DOE Construction Projects, using the Defense Programs and General Construction guidance.

5. Method of Performance

Design will be performed by an architect-engineer under a fixed-price contract. Inspection will be performed by Sandia. Construction and procurement will be accomplished by fixed-price contracts awarded on the basis of competitive bidding. A design-build strategy was evaluated, but will not be utilized primarily because the funding schedule is not compatible with design-build.

6. Schedule of Project Funding

(dollars in thousands)

	Prior Years	FY 1999	FY 2000	FY 2001	Outyears	Total
Project Cost						
Facility Costs						
Design	0	0	0	1,600	1,011	2,611
Construction	0	0	0	0	32,889	32,889
Total, Line item TEC	0	0	0	1,600	33,900	35,500
Total Facility Costs (Federal and Non-Federal)	0	0	0	1,600	33,900	35,500
Other Project Costs						
Conceptual design costs	637	0	0	0	0	637
Other project-related costs [a]	111	200	200	300	1,152	1,963
Total, Other Project Costs	748	200	200	300	1,152	2,600
Total Project Cost (TPC)	748	200	200	1,900	35,052	38,100

[a] Includes funding to complete the Project Execution Plan, Construction Project Data Sheets, Validations, Design Criteria, A/E Selection, Value Engineering Study, Program Management Support, Readiness Assessment, Start-Up, Move-In, Project Close-Out, and Final Cost Report.

7. Related Annual Funding Requirements

(FY 2004 dollars in thousands)

	Current Estimate	Previous Estimate
Annual facility operating costs [a]	290	N/A
Annual facility maintenance/repair costs [b]	80	N/A
Programmatic operating expenses directly related to the facility [c]	30,000	N/A
Capital equipment not related to construction but related to the programmatic effort in the facility [d]	2,500	N/A
Utility costs	310	N/A
Total related annual funding (operating from FY 2004 through FY 2034)	33,180	N/A

[a] Average annually facility operating costs for materials and labor, including systems operations and custodial services, beginning when the facility is operational in the 3rd Quarter of FY 2004. An average total of 4.3 staff years per year will be required to operate the facility. The new facility will be built at the location where a previous facility existed; however, the new facility does not replace the old one.

[b] Average annual facility maintenance and repair costs for materials and labor, beginning when operational in the 3rd Quarter of FY 2004. An average total of 0.4 staff years per year will be required to maintain and repair the facility.

[c] Annual programmatic operating expenses based on representative current operating expenses of 130 people. The majority of this funding is expected to come from the DOE-DP Offices of Stockpile Computation and Modeling, and Strategic Computing and Modeling. Lesser amounts are expected from other DOE-DP Offices for activities that support their mission needs for engineering information management.

[d] Because information technology evolves with a cycle of 1 to 2 years, DISL activities will require this annual capital equipment outlay.